Research & Demonstration Grant Funding Program Annual Report

Please return the completed form along with the below referenced supplemental information to Jason Coleman at jason.coleman@hpwd.org.

NAME: Michelle A. Sutherland	
ADDRESS: 9308 Castle Pines Drive, 78717	**PHONE NUMBER: 949-702-3622**
CELL NUMBER: 949-702-3622	**EMAIL: michelleasutherland@gmail.com**
PROJECT TITLE: 3D Visualization of Aquifer Water Levels	
TOTAL FUNDING: $10,000	
PROJECT COMPLETED: ☐ Yes or ☒ No	**EXPECTED COMPLETION DATE: 7/31/2020**
PREFERRED PRESENTATION MONTH: September / October 2020	

Attached to this document please provide the following supplemental information:

- Financial report showing expenses, remaining funds, and financial contributions from cooperators and other funding sources.
- Any supplemental materials you would like the HPWD Board of Directors to review.
- A copy of the presentation materials for the HPWD Board of Directors meeting presentation.

1. Describe your progress to date with the project (Word Limit 150):

The goal of the project is to create a 3D geologic model of the Ogallala Aquifer in the HPWD boundaries that shows changes in water levels over time in an interactive 3D viewing format. To date, I downloaded base of aquifer data and water level data from the HPWD area via the TWDB Database and TWDB Groundwater Availability Modeling (GAM) program. This data was then interpolated using 3D geological modeling software (Leapfrog Works®) and posted in a 3D modeling environment. I am in the process of creating multiple 3D scenes to show measured changes in water levels over time. These 3D scenes will then be uploaded to an interactive website. The framework for the website has been completed in collaboration with Seequent, the developers of Leapfrog Works®.

2. Describe successes or setbacks observed with implementing the project (Word Limit 150):

I was successful in creating a 3D visualization of the aquifer from existing publicly available data. Because of the size of the District, the greatest challenge has been experimenting with different scales and vertical exaggerations of the model to clearly communicate changes in water level elevation over different geographic areas. A minor challenge is being mindful of file size so that model files are not too large for upload to a website or would cause the online model to run slowly.

I have been working with Seequent as a beta-tester for creating online 3D geologic models. I believe that moving models to an interactive, online format increases the visibility and accessibility of 3D models. As a beta-tester, I gave feedback and suggestions early in the software development process. The online tools have become more robust over the past year and will continue to improve with time. An online version of the model will be provided for District feedback and will be kept confidential until the District approves publication.

3. Describe the results of the proposed work objectives and expected impact of the research/demonstration being conducted (Word Limit 250):

The result of the proposed work objective will be the creation of an online 3D geologic model of the Ogallala Aquifer in the HPWD service area. To my knowledge, this will be the first 3D geologic model in Texas that will be accessible through a web browser, rather than simply having a preset file available for download. The model can be operated on the website with a handful of simple tools, rather than requiring specialized knowledge of various software packages.

The expected impact is that more people will be able to "see" their aquifer in a 3D space and therefore more readily understand the architecture of the aquifer than if they were viewing a traditional 2D map. Tools such as TWDB Groundwater Availability Models (GAMs) and 2D contour maps require specialized training to interpret and understand in relation to other aquifer data. My hope is that by having a publicly available, interactive three-dimensional model, the District can more easily educate stakeholders about the geometry of the aquifer and nature of their water resource.

4. Describe the conservation impacts to the District (Word Limit 150):

By identifying changes in water levels across the District, the model scenes will be used to illustrate areas where conservation efforts have made a positive impact, by either slowing the rate of water level decline or by showing water level increases. It also will show areas that have been most heavily pumped over many decades, giving scale and context to the importance of conservation. This 3D visualization is intended to be used as a communication tool for education and outreach.

5. **Please describe any outreach and communication plans you have for this project, including any awards submissions or potential opportunities for publishing (Word Limit 150):**

Upon District approval, I would like to publish the results of the 3D visualization of aquifer water levels as an interactive website that links to the HPWD website. I would also like to submit a journal article for publication that details the methodology for water resource assessment using 3D geologic modeling tools. A group in Switzerland recently published techniques for 3D modeling of complex mountain system geology (Nature, 2019). I believe that publishing a paper on the application of 3D tools to dynamic groundwater systems would be equally valuable.